

CLAIMS

What is claimed is:

1. A method of inspection or review of a substrate having insulating materials therein, the method comprising:

simultaneously exposing an area of the substrate with a lower-energy electron beam and an overlapping higher-energy electron beam; and

5 subsequently inspecting the area with another beam.

2. The method of claim 1, wherein the simultaneous exposure of the area to the lower-energy and higher-energy electron beams causes surface charge neutralization.

10

3. The method of claim 1, wherein the lower-energy electron beam has a landing energy of less than one electron volt.

4. The method of claim 3, wherein the higher-energy electron beam has a landing energy on the order of a few hundred electron volts.

15

5. The method of claim 1, further comprising:
generating a scattered electron beam including reflected electrons from the lower-energy beam and scattered electrons caused by the higher-energy beam.

20

6. The method of claim 1, wherein the lower-energy electron beam is generated using a first cathode at a voltage slightly more negative than a surface voltage of the substrate.

7. The method of claim 6, wherein the higher-energy electron beam is generated using a second cathode at a voltage substantially more negative than the surface voltage of the substrate.

5 8. The method of claim 7, wherein the first cathode is part of a first electron gun, wherein the second cathode is part of a second electron gun, and the first and second electron guns are inclined at an angle to each other.

9. The method of claim 7, wherein the first and second cathodes are part
10 of a dual-beam flood gun.

10. The method of claim 1, wherein the substrate comprises a semiconductor substrate for integrated circuit manufacture.

15 11. The method of claim 1, wherein charge neutralization of the substrate is performed by scanning the lower-energy beam and overlapping higher-energy beam over the substrate.

12. The method of claim 1, wherein charge neutralization of the substrate
20 is performed by a single exposure of the lower-energy beam and overlapping higher-energy beam.

13. An electron beam tool for examination of a substrate having insulating materials therein, the electron beam tool comprising:

25 a first cathode configured as an electron source for a lower-energy electron beam;

11.2500(P1305)

a second cathode configured as an electron source for a higher-energy electron beam;

at least one electron lens configured to focus the lower-energy electron beam and the higher-energy electron beam onto an overlapping area of a substrate; and

5 an electron beam column for subsequent examination of the substrate.

14. The electron beam tool of claim 13, wherein the simultaneous exposure of the area to the lower-energy and higher-energy electron beams causes surface charge neutralization.

10

15. The electron beam tool of claim 13, wherein the lower-energy electron beam has a landing energy of less than one electron volt.

16. The electron beam tool of claim 15, wherein the higher-energy electron beam has a landing energy on the order of a few hundred electron volts.

15

17. The electron beam tool of claim 13, wherein a scattered electron beam is generated that includes reflected electrons from the lower-energy beam and scattered electrons caused by the higher-energy beam.

20

18. The electron beam tool of claim 13, wherein the first cathode is controlled to be at a voltage slightly more negative than a surface voltage of the substrate.

25

19. The electron beam tool of claim 18, wherein the second cathode is controlled to be at a voltage substantially more negative than the surface voltage of the substrate.

20. The electron beam tool of claim 19, wherein the first cathode is part of a first electron gun, wherein the second cathode is part of a second electron gun, and the first and second electron guns are inclined at an angle to each other.

5

21. The electron beam tool of claim 19, wherein the first and second cathodes are part of a dual-beam flood gun.

22. The electron beam tool of claim 13, wherein the substrate comprises a semiconductor substrate for integrated circuit manufacture.

10

23. The electron beam tool of claim 13, wherein charge neutralization of the substrate is performed by scanning the lower-energy beam and overlapping higher-energy beam over the substrate.

15

24. The electron beam tool of claim 13, wherein charge neutralization of the substrate is performed by a single exposure of the lower-energy beam and overlapping higher-energy beam.

25. An apparatus for inspection or review of a substrate having insulating materials therein, the apparatus comprising:

20

means for simultaneously exposing an area of the substrate with a lower-energy electron beam and an overlapping higher-energy electron beam; and means for subsequently inspecting the area with another beam.

25

11.2500(P1305)

26. The apparatus of claim 25, wherein the other beam comprises an electron beam.

27. The apparatus of claim 25, wherein the other beam comprises a
5 focused ion beam.